

Barn Considerations for Cash Hay Operations

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A well designed and built a barn can be invaluable for cash hay operation. Barn provide opportunity to reduce losses in dry matter and help maintain quality throughout the winter. There are numerous styles of barns that hay producers can purchase or build themselves. Wood frame structures, often with metal roofs and metal sides, are fairly common. You can also build barns with a steel structure with or without metal siding on the walls. Hoop barns are another common hay storage structure - particularly common with round bale storage. All, however, provide valuable storage for hay. There are four areas of consideration for ensuring the barn style chosen will be effective on a specific hay operation: site selection, barn sizing, construction approaches, and ventilation.

Site Selection

Site selection can make a huge difference in how effective a barn can protect hay from weather as well as impact accessibility, safety, and security. A barn should not be placed in a low-lying or wet area, and any excavation done prior to construction should intentionally shed water away from the barn. Barns should be accessible for easy storage and retrieval of hay as well as for your hay buyers in all weather conditions. Consider a large staging area and turning area for trucks and trailers – remember, not all customers are highly proficient at maneuvering their trucks and trailers! If you ever plan to expand and add more barns, it is recommended to have 75 feet or more between barns for fire safety. And, unfortunately, consider the security of your barn and install security lights to deter someone from potentially stealing your hay.

Barn Sizing

One of the real challenges in considering hay barns, is choosing the right size and footprint for the barn. The size of bales produced will influence the necessary dimensions of the barn. As a general rule, square bales will need a footprint of 10 to 15 square-feet for every ton of hay and for round bales 16 to 24 square-feet will be required for every ton of hay. The barn should be wide enough to allow for the hay to be stacked with a 2-foot buffer between the edge of the haystack and the wall. In addition, there should be at least 2-feet between the top of the haystack and the bottom of the truss. The capacity of the barn should be determined based upon how you stack your hay. Some producers stack square bales the full depth of the barn, while others leave space between stacks to allow the hay to breathe better. The round bales pyramid stacking or barrel stacking the bottom row in a barn will affect storage capacity. One philosophical consideration each producer must determine for themselves is if they want to grade their hay and if so how many different products do they want to market. Some producers may prioritize a first-in/first-out approach with one product while others may choose to sell hay based upon cutting and/or field. An important consideration in barns with closed walls is that there are less access points to the hay stacks making grading and sorting more difficult. Adding additional doors may be helpful or constructing the barn with one side completely open.

Barn Construction

When constructing a barn there are some strategies to improve the performance of the barn. First, choose the right flooring. The purpose of the barn is to reduce the breakdown of bales. Typically, condensation on the floor is one of the most challenging management points in a barn. Concrete wears

well with equipment loads and is easy to clean at the end of the season; however due to its conductivity, it is susceptible to condensation. Pallets are often used in order to allow the floor to breathe thereby reducing condensation and potential mold on floor bales. Unfortunately, the labor in moving pallets does make them a less desirable material. A well-built elevated gravel pad in the barn is a strategy to improve floor bale quality. A second tip for barn performance is to ensure that bales are not leaning against the walls in the barn.

Typically, the sidewalls are not designed to handle a load pushing on the post. This pressure on the posts can damage the structure prematurely. The final tip on the construction of a hay barn is to remember that open sided barns are susceptible to wind loads. Most hay barns are at least partially open and therefore susceptible to wind loads trying to lift posts. A properly embedded post set at least 4 feet in the ground with a concrete anchor at the base of the post should keep your hay barn from needing repairs due to typical winds.

Ventilation

The final consideration in developing a hay barn is ventilation. A barn that is completely sealed on all sides will have moisture issues. During the initial heat cycle and throughout the storage period, hay will be releasing moisture. In addition, here in Kentucky, our climate swings in temperature that often have condensation occurring on metal roofs and sidewalls. If barns are not well ventilated, all this moisture will reenter the hay bales. No drip coatings on metal siding can reduce water dripping within a barn; however without ventilation, the moisture does not leave the barn and can still be reabsorbed by the bales. Barns that are less than 70 feet and have open end walls can potentially be ventilated through the end walls alone. However, for barns with a length greater than seventy feet, the barns should have openings at the eaves and bottom of the sidewalls as well as a vent in the peak of the roofline.

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BARNs BARNs BARNs



Site Selection

- Drainage
- Access
- Building separation and expansion



Drainage

- Avoid low spots and steep slopes
- Drain water away from barn and access area
- Slope surrounding ground away from walls (about 5% = 5 ft. vertical per 100-ft horizontal)
- Divert runoff from adjacent areas



Access

- Plan for convenient access:
 - Roads, gates, distance from hay fields
 - Security from fire and theft
- Roadways and turning areas should allow ample space for trailers and bale wagons:
 - 75' x 125' for vehicle maneuvering
- Plan to accommodate heavy equipment
- All weather access



Building separation and expansion

- Spacing is often a compromise between safety and practicality
- Allow adequate space for future expansion
- Space buildings at least 75-ft apart to reduce the spread of fire
- Availability of water in case of fire is desirable



Barn Size

- Building Space
- Hay Type/Grading
- Storage Capacity



Building space

- Allow 10 to 15 ft²/ton for square bales
- Allow 16 to 24 ft²/ton for round bales
- For 5' x 5' bales
 - Stacked 3-high: 10 to 12 sq. ft. per bale
 - Stacked 2-high: 15 to 17 sq. ft. per bale



How do you manage your hay?

- Small Square, Large Square, or Round Bales
- How many bales?
- Do you need to grade and have access to different fields/cuttings, ect...?
- Accessibility from both endwalls or multiple sidewalls



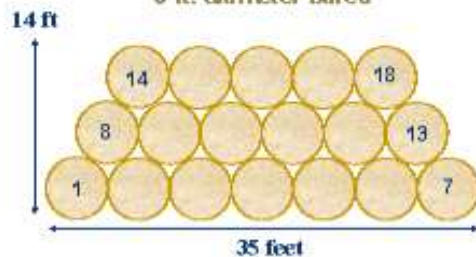
5x5 Bale Storage Capacity

Barn Dimensions	Floor Area sq. ft.	End Access	Side Access
32 x 64	2048	180	198
36 x 64	2304	216	231
42 x 64	2688	252	264
48 x 64	3072	288	297

(Based on using approximately 60 bales to fill 1 ft³)

Stack Height

5 ft. diameter bales



Stack Height + 2' = 16' Floor to truss clearance



Stack Height

6 ft. diameter bales



Stack Height + 2' = 18'-9" Floor to truss clearance



Construction Tips

- Floor
- Sidewall
- Wind Load

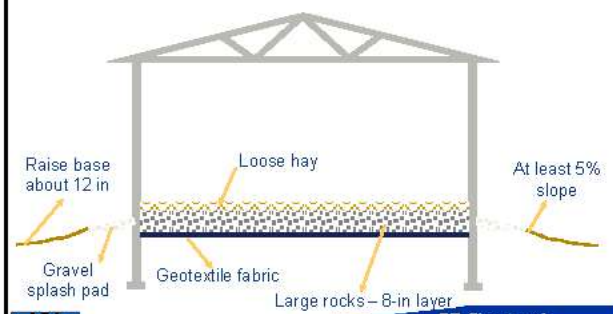


Floor and base

- Compacted gravel – use large rocks
- Geotextile with compacted gravel
- Compacted gravel with shipping pallets, rough boards or planks
- Concrete
- Layer of loose hay



Floor and base construction



Sidewall pressure

- Post – Frame Hay Barns are NOT designed for storing hay against the walls
- Steel buildings may require extra sidewall girts to protect metal siding



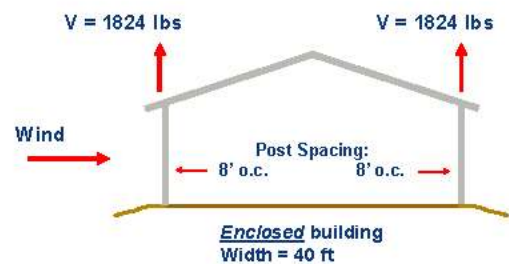
Bales against end wall –

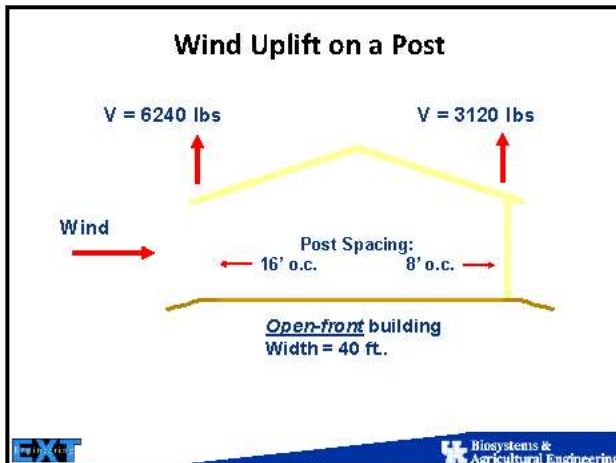
Wall bulging 6 to 12 inches

Large Poles
Added boards
To protect metal

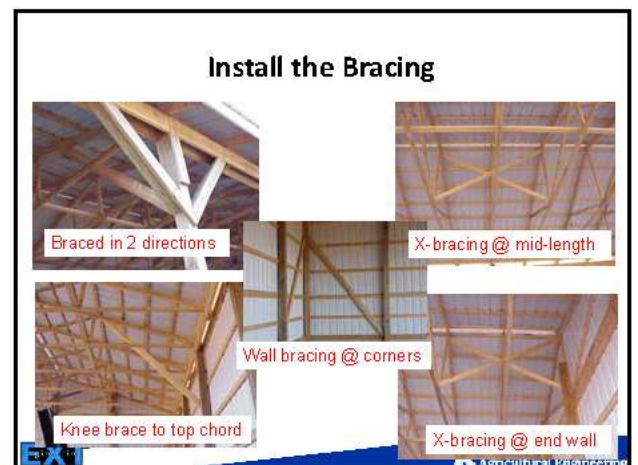
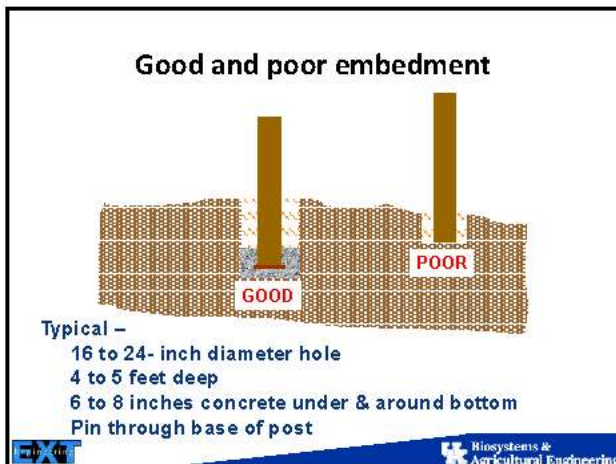


Wind Uplift on a Post





- ### Post Embedment
- Foundation resists vertical and lateral loads
 - Posts no less than 4 ft. in ground
 - > 5 feet for tall, wide, or open front barns
 - Concrete under post
 - Concrete collar around bottom to resist wind uplift forces
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Ventilation

- Why
- Principles
- Tips

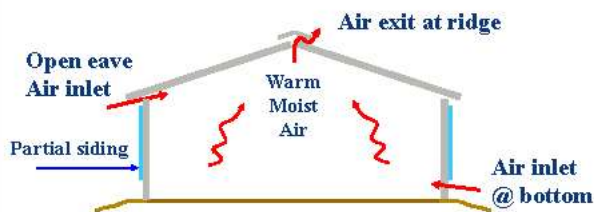


Ventilation

- Remove moisture:
 - Hay is not completely dry
 - Respiration generates moisture
 - Moisture can migrate within the stack
 - Condensation & drip from metal roofs



Ventilation Principles



Ventilation

- Air exchange is key:
 - Natural ventilation – Do not trap moisture
- End to end ventilation – < 70 feet long
 - Vent openings in both ends
- Ridge vents for enclosed buildings
- Air inlets at eaves
- Air inlets at bottom



Questions



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